

SEQUENCE LISTING

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B1  
<120> METHOD FOR PRODUCING L-GLUTAMIC ACID BY FERMENTATION ACCOMPANIED BY  
PRECIPITATION

<130> 195942US0

<140> 09/641,892

<141> 2000-08-18

<150> JP2000-78771

<151> 2000-03-21

<150> JP11-234806

<151> 1999-08-20

<160> 12

<170> PatentIn version 3.0

<210> 1

<211> 4556

<212> DNA

<213> Enterobacter agglomerans

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			Met Gln	
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Asn Ser Ala Met Lys Pro Trp Leu Asp Ser Ser Trp Leu Ala Gly Ala	45	50	55	
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Asn Gln Ser Tyr Ile Glu Gln Leu Tyr Glu Asp Phe Leu Thr Asp Pro	60	65	70	
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Asp Ser Val Asp Ala Val Trp Arg Ser Met Phe Gln Gln Leu Pro Gly	75	80	85	
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Thr Gly Val Lys Pro Glu Gln Phe His Ser Ala Thr Arg Glu Tyr Phe	90	95	100	105
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Arg Arg Leu Ala Lys Asp Ala Ser Arg Tyr Thr Ser Ser Val Thr Asp	110	115	120	
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Pro Ala Thr Asn Ser Lys Gln Val Lys Val Leu Gln Leu Ile Asn Ala	125	130	135	
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Phe Arg Phe Arg Gly His Gln Glu Ala Asn Leu Asp Pro Leu Gly Leu	140	145	150	
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Trp Lys Gln Asp Arg Val Ala Asp Leu Asp Pro Ala Phe His Asp Leu	155	160	165	

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Thr Asp Ala Asp Phe Gln Glu Ser Phe Asn Val Gly Ser Phe Ala Ile	
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Gly Lys Glu Thr Met Lys Leu Ala Asp Leu Phe Asp Ala Leu Lys Gln	
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Thr Tyr Cys Gly Ser Ile Gly Ala Glu Tyr Met His Ile Asn Asn Thr	
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Thr Ser Phe Ser Gly Glu Glu Lys Lys Gly Phe Leu Lys Glu Leu Thr	
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Gly Met Ala His Arg Gly Arg Leu Asn Val Leu Ile Asn Val Leu Gly	
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Ile Glu Thr Glu Gly Leu Val His Leu Ala Leu Ala Phe Asn Pro	
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Thr	Ile	His	Gly	Asp	Ala	Ala	Val	Ile	Gly	Gln	Gly	Val	Val	Gln	Glu	
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Thr	Leu	Asn	Met	Ser	Gln	Ala	Arg	Gly	Tyr	Glu	Val	Gly	Gly	Thr	Val	
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Arg	Ile	Val	Ile	Asn	Asn	Gln	Val	Gly	Phe	Thr	Thr	Ser	Asn	Pro	Lys	
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Ala	Pro	Ile	Phe	His	Val	Asn	Ala	Asp	Asp	Pro	Glu	Ala	Val	Ala	Phe	
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Val	Thr	Arg	Leu	Ala	Leu	Asp	Tyr	Arg	Asn	Thr	Phe	Lys	Arg	Asp	Val	
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Phe	Ile	Asp	Leu	Val	Cys	Tyr	Arg	Arg	His	Gly	His	Asn	Glu	Ala	Asp	
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Glu	Pro	Ser	Ala	Thr	Gln	Pro	Leu	Met	Tyr	Gln	Lys	Ile	Lys	Lys	His	
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Pro	Thr	Pro	Arg	Lys	Ile	Tyr	Ala	Asp	Arg	Leu	Glu	Gly	Glu	Gly	Val	
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gcg	tcg	cag	gaa	gat	gcc	acc	gag	atg	gtg	aac	ctg	tac	cgc	gat	gcg	1863
Ala	Ser	Gln	Glu	Asp	Ala	Thr	Glu	Met	Val	Asn	Leu	Tyr	Arg	Asp	Ala	
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Gly Tyr Glu Gly Gln Gly Pro Glu His Ser Ser Ala Arg Leu Glu Arg	
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Tyr Leu Gln Leu Cys Ala Glu Gln Asn Met Gln Val Cys Val Pro Ser	
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Thr Pro Ala Gln Val Tyr His Met Leu Arg Arg Gln Ala Leu Arg Gly	
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Val Val Leu Cys Ser Gly Lys Val Tyr Tyr Asp Leu Leu Glu Gln Arg	
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Arg Lys Asp Glu Lys Thr Asp Val Ala Ile Val Arg Ile Glu Gln Leu	
875 880 885	
tac ccg ttc ccg cat cag gcg gta cag gaa gca ttg aaa gcc tat tct	2919
Tyr Pro Phe Pro His Gln Ala Val Gln Glu Ala Leu Lys Ala Tyr Ser	
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His Val Gln Asp Phe Val Trp Cys Gln Glu Glu Pro Leu Asn Gln Gly	
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Leu	Val	Pro	Asp	Leu	Pro	Glu	Ser	Val	Ala	Asp	Ala	Thr	Val	Ala	Thr		
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Trp	His	Lys	Lys	Pro	Gly	Asp	Ala	Val	Ser	Arg	Asp	Glu	Val	Ile			
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Lys	Ala	Ala	Ala	Pro	Ala	Ala	Gly	Ala	Ala	Thr	Ala	Gln	Gln	Pro			



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Val Ala Asn Arg	Ser Glu Lys Arg	Val Pro Met Thr Arg	Leu Arg													
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Lys Arg Val Ala	Glu Arg Leu Leu	Glu Ala Lys Asn Ser	Thr Ala													
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Pro Ile Ile Asn	Pro Pro Gln Ser	Ala Ile Leu Gly Met	His Ala													
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Ile	Lys	Asp	Arg	Pro	Met	Ala	Val	Asn	Gly	Gln	Val	Val	Ile	Leu	
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cca	atg	atg	tac	ctg	gct	ctc	tcc	tac	gat	cac	cgt	tta	atc	gat	4290
Pro	Met	Met	Tyr	Leu	Ala	Leu	Ser	Tyr	Asp	His	Arg	Leu	Ile	Asp	
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Gly	Arg	Glu	Ser	Val	Gly	Tyr	Leu	Val	Ala	Val	Lys	Glu	Met	Leu	
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gaa	gat	ccg	gcg	cgt	ctg	ctg	ctg	gat	gtc	tga	ttcatcactg				4378
Glu	Asp	Pro	Ala	Arg	Leu	Leu	Leu	Asp	Val						
			1375					1380							

ggc	acg	cggtt	gcgtg	cccaa	tctca	atact	cttttc	cagat	ctgaat	ggat	agaac	atc			4436
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atg	aac	tta	cac	gaa	tac	cag	gct	aaa	cag	ctg	ttt	gca	cgg	tat	4481
Met	Asn	Leu	His	Glu	Tyr	Gln	Ala	Lys	Gln	Leu	Phe	Ala	Arg	Tyr	
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Gly	Met	Pro	Ala	Pro	Thr	Gly	Tyr	Ala	Cys	Thr	Thr	Pro	Arg	Glu	
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gca	gaa	gaa	gcg	gca	tcg	aaa	atc	ggg	gca						4556
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<212> PRT

<213> Enterobacter agglomerans

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<213> Enterobacter agglomerans

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Asp Pro Asp Ser Val Asp Ala Val Trp Arg Ser Met Phe Gln Gln Leu  
35 40 45

Pro Gly Thr Gly Val Lys Pro Glu Gln Phe His Ser Ala Thr Arg Glu  
50 55 60

Tyr Phe Arg Arg Leu Ala Lys Asp Ala Ser Arg Tyr Thr Ser Ser Val  
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Thr Asp Pro Ala Thr Asn Ser Lys Gln Val Lys Val Leu Gln Leu Ile  
85 90 95

Asn Ala Phe Arg Phe Arg Gly His Gln Glu Ala Asn Leu Asp Pro Leu  
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Gly Leu Trp Lys Gln Asp Arg Val Ala Asp Leu Asp Pro Ala Phe His  
115 120 125

Asp Leu Thr Asp Ala Asp Phe Gln Glu Ser Phe Asn Val Gly Ser Phe  
130 135 140

Ala Ile Gly Lys Glu Thr Met Lys Leu Ala Asp Leu Phe Asp Ala Leu  
145 150 155 160

Lys Gln Thr Tyr Cys Gly Ser Ile Gly Ala Glu Tyr Met His Ile Asn  
165 170 175

Asn Thr Glu Glu Lys Arg Trp Ile Gln Gln Arg Ile Glu Ser Gly Ala  
180 185 190

Ser Gln Thr Ser Phe Ser Gly Glu Glu Lys Lys Gly Phe Leu Lys Glu  
195 200 205

Leu Thr Ala Ala Glu Gly Leu Glu Lys Tyr Leu Gly Ala Lys Phe Pro  
210 215 220

Gly Ala Lys Arg Phe Ser Leu Glu Gly Gly Asp Ala Leu Val Pro Met  
225 230 235 240

Leu Arg Glu Met Ile Arg His Ala Gly Lys Ser Gly Thr Arg Glu Val  
245 250 255

Val Leu Gly Met Ala His Arg Gly Arg Leu Asn Val Leu Ile Asn Val  
260 265 270

Leu Gly Lys Lys Pro Gln Asp Leu Phe Asp Glu Phe Ser Gly Lys His  
275 280 285

Lys Glu His Leu Gly Thr Gly Asp Val Lys Tyr His Met Gly Phe Ser  
290 295 300

Ser Asp Ile Glu Thr Glu Gly Gly Leu Val His Leu Ala Leu Ala Phe  
305 310 315 320

Asn Pro Ser His Leu Glu Ile Val Ser Pro Val Val Met Gly Ser Val

325

330

335

Arg Ala Arg Leu Asp Arg Leu Ala Glu Pro Val Ser Asn Lys Val Leu  
 340 345 350

Pro Ile Thr Ile His Gly Asp Ala Ala Val Ile Gly Gln Gly Val Val  
 355 360 365

Gln Glu Thr Leu Asn Met Ser Gln Ala Arg Gly Tyr Glu Val Gly Gly  
 370 375 380

Thr Val Arg Ile Val Ile Asn Asn Gln Val Gly Phe Thr Thr Ser Asn  
 385 390 395 400

Pro Lys Asp Ala Arg Ser Thr Pro Tyr Cys Thr Asp Ile Gly Lys Met  
 405 410 415

Val Leu Ala Pro Ile Phe His Val Asn Ala Asp Asp Pro Glu Ala Val  
 420 425 430

Ala Phe Val Thr Arg Leu Ala Leu Asp Tyr Arg Asn Thr Phe Lys Arg  
 435 440 445

Asp Val Phe Ile Asp Leu Val Cys Tyr Arg Arg His Gly His Asn Glu  
 450 455 460

Ala Asp Glu Pro Ser Ala Thr Gln Pro Leu Met Tyr Gln Lys Ile Lys  
 465 470 475 480

Lys His Pro Thr Pro Arg Lys Ile Tyr Ala Asp Arg Leu Glu Gly Glu  
 485 490 495

Gly Val Ala Ser Gln Glu Asp Ala Thr Glu Met Val Asn Leu Tyr Arg  
 500 505 510

Asp Ala Leu Asp Ala Gly Glu Cys Val Val Pro Glu Trp Arg Pro Met  
 515 520 525

Ser Leu His Ser Phe Thr Trp Ser Pro Tyr Leu Asn His Glu Trp Asp  
 530 535 540

Glu Pro Tyr Pro Ala Gln Val Asp Met Lys Arg Leu Lys Glu Leu Ala  
 545 550 555 560

Leu Arg Ile Ser Gln Val Pro Glu Gln Ile Glu Val Gln Ser Arg Val  
 565 570 575

Ala Lys Ile Tyr Asn Asp Arg Lys Leu Met Ala Glu Gly Glu Lys Ala  
 580 585 590

Phe Asp Trp Gly Gly Ala Glu Asn Leu Ala Tyr Ala Thr Leu Val Asp  
 595 600 605

Glu Gly Ile Pro Val Arg Leu Ser Gly Glu Asp Ser Gly Arg Gly Thr  
 610 615 620

Phe Phe His Arg His Ala Val Val His Asn Gln Ala Asn Gly Ser Thr  
 625 630 635 640

Tyr Thr Pro Leu His His Ile His Asn Ser Gln Gly Glu Phe Lys Val  
 645 650 655

Trp Asp Ser Val Leu Ser Glu Glu Ala Val Leu Ala Phe Glu Tyr Gly  
 660 665 670

Tyr Ala Thr Ala Glu Pro Arg Val Leu Thr Ile Trp Glu Ala Gln Phe  
 675 680 685

Gly Asp Phe Ala Asn Gly Ala Gln Val Val Ile Asp Gln Phe Ile Ser  
 690 695 700

Ser Gly Glu Gln Lys Trp Gly Arg Met Cys Gly Leu Val Met Leu Leu  
 705 710 715 720

Pro His Gly Tyr Glu Gly Gln Gly Pro Glu His Ser Ser Ala Arg Leu  
725 730 735

Glu Arg Tyr Leu Gln Leu Cys Ala Glu Gln Asn Met Gln Val Cys Val  
740 745 750

Pro Ser Thr Pro Ala Gln Val Tyr His Met Leu Arg Arg Gln Ala Leu  
755 760 765

Arg Gly Met Arg Arg Pro Leu Val Val Met Ser Pro Lys Ser Leu Leu  
770 775 780

Arg His Pro Leu Ala Ile Ser Ser Leu Asp Glu Leu Ala Asn Gly Ser  
785 790 795 800

Phe Gln Pro Ala Ile Gly Glu Ile Asp Asp Leu Asp Pro Gln Gly Val  
805 810 815

Lys Arg Val Val Leu Cys Ser Gly Lys Val Tyr Tyr Asp Leu Leu Glu  
820 825 830

Gln Arg Arg Lys Asp Glu Lys Thr Asp Val Ala Ile Val Arg Ile Glu  
835 840 845

Gln Leu Tyr Pro Phe Pro His Gln Ala Val Gln Glu Ala Leu Lys Ala  
850 855 860

Tyr Ser His Val Gln Asp Phe Val Trp Cys Gln Glu Glu Pro Leu Asn  
865 870 875 880

Gln Gly Ala Trp Tyr Cys Ser Gln His His Phe Arg Asp Val Val Pro  
885 890 895

Phe Gly Ala Thr Leu Arg Tyr Ala Gly Arg Pro Ala Ser Ala Ser Pro  
900 905 910

Ala Val Gly Tyr Met Ser Val His Gln Gln Gln Gln Gln Asp Leu Val

915

920

925

Asn Asp Ala Leu Asn Val Asn  
 930 935

&lt;210&gt; 4

&lt;211&gt; 407

&lt;212&gt; PRT

&lt;213&gt; Enterobacter agglomerans

&lt;400&gt; 4

Met Ser Ser Val Asp Ile Leu Val Pro Asp Leu Pro Glu Ser Val Ala  
 1 5 10 15

Asp Ala Thr Val Ala Thr Trp His Lys Lys Pro Gly Asp Ala Val Ser  
 20 25 30

Arg Asp Glu Val Ile Val Glu Ile Glu Thr Asp Lys Val Val Leu Glu  
 35 40 45

Val Pro Ala Ser Ala Asp Gly Val Leu Glu Ala Val Leu Glu Asp Glu  
 50 55 60

Gly Ala Thr Val Thr Ser Arg Gln Ile Leu Gly Arg Leu Lys Glu Gly  
 65 70 75 80

Asn Ser Ala Gly Lys Glu Ser Ser Ala Lys Ala Glu Ser Asn Asp Thr  
 85 90 95

Thr Pro Ala Gln Arg Gln Thr Ala Ser Leu Glu Glu Glu Ser Ser Asp  
 100 105 110

Ala Leu Ser Pro Ala Ile Arg Arg Leu Ile Ala Glu His Asn Leu Asp  
 115 120 125



Ala Ala Gln Ile Lys Gly Thr Gly Val Gly Gly Arg Leu Thr Arg Glu  
130 135 140

Asp Val Glu Lys His Leu Ala Asn Lys Pro Gln Ala Glu Lys Ala Ala  
145 150 155 160

Ala Pro Ala Ala Gly Ala Ala Thr Ala Gln Gln Pro Val Ala Asn Arg  
165 170 175

Ser Glu Lys Arg Val Pro Met Thr Arg Leu Arg Lys Arg Val Ala Glu  
180 185 190

Arg Leu Leu Glu Ala Lys Asn Ser Thr Ala Met Leu Thr Thr Phe Asn  
195 200 205

Glu Ile Asn Met Lys Pro Ile Met Asp Leu Arg Lys Gln Tyr Gly Asp  
210 215 220

Ala Phe Glu Lys Arg His Gly Val Arg Leu Gly Phe Met Ser Phe Tyr  
225 230 235 240

Ile Lys Ala Val Val Glu Ala Leu Lys Arg Tyr Pro Glu Val Asn Ala  
245 250 255

Ser Ile Asp Gly Glu Asp Val Val Tyr His Asn Tyr Phe Asp Val Ser  
260 265 270

Ile Ala Val Ser Thr Pro Arg Gly Leu Val Thr Pro Val Leu Arg Asp  
275 280 285

Val Asp Ala Leu Ser Met Ala Asp Ile Glu Lys Lys Ile Lys Glu Leu  
290 295 300

Ala Val Lys Gly Arg Asp Gly Lys Leu Thr Val Asp Asp Leu Thr Gly  
305 310 315 320

Gly Asn Phe Thr Ile Thr Asn Gly Gly Val Phe Gly Ser Leu Met Ser  
 325 330 335

Thr Pro Ile Ile Asn Pro Pro Gln Ser Ala Ile Leu Gly Met His Ala  
 340 345 350

Ile Lys Asp Arg Pro Met Ala Val Asn Gly Gln Val Val Ile Leu Pro  
 355 360 365

Met Met Tyr Leu Ala Leu Ser Tyr Asp His Arg Leu Ile Asp Gly Arg  
 370 375 380

Glu Ser Val Gly Tyr Leu Val Ala Val Lys Glu Met Leu Glu Asp Pro  
 385 390 395 400

Ala Arg Leu Leu Leu Asp Val  
 405

<210> 5

<211> 40

<212> PRT

<213> Enterobacter agglomerans

<400> 5

Met Asn Leu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr Gly  
 1 5 10 15

Met Pro Ala Pro Thr Gly Tyr Ala Cys Thr Thr Pro Arg Glu Ala Glu  
 20 25 30

Glu Ala Ala Ser Lys Ile Gly Ala  
 35 40

<210> 6

<211> 30

<212> DNA


<213> Artificial/Unknown

<220>

<221> misc\_feature

<222> ()..()

<223> Artificial Sequence: synthetic DNA

  
<400> 6

gtcgacaata gccygaatct gttctggtcg

30

<210> 7

<211> 30

<212> DNA

<213> Artibeus anderseni

<220>

<221> misc\_feature

<222> ()..()

<223> Artificial Sequence: synthetic DNA

<400> 7

aagcttatcg acgctcccct ccccaccgtt

30

<210> 8

<211> 936

<212> PRT

<213> Escherichia coli

<400> 8

Met Gln Asn Ser Ala Leu Lys Ala Trp Leu Asp Ser Ser Tyr Leu Ser  
1 5 10 15

Gly Ala Asn Gln Ser Trp Glu Ile Glu Gln Leu Tyr Glu Asp Phe Leu  
20 25 30

Thr Asp Pro Asp Ser Val Asp Ala Asn Trp Arg Ser Thr Phe Gln Gln  
35 40 45

Leu Pro Gly Thr Gly Val Lys Pro Asp Gln Phe His Ser Gln Thr Arg  
50 55 60

Glu Tyr Phe Arg Arg Leu Ala Lys Asp Ala Ser Arg Tyr Ser Ser Thr  
65 70 75 80

Ile Ser Asp Pro Asp Thr Asn Val Lys Gln Val Lys Val Leu Gln Leu  
85 90 95

Ile Asn Ala Tyr Arg Phe Arg Gly His Gln His Ala Asn Leu Asp Pro  
100 105 110

Leu Gly Leu Trp Gln Gln Asp Lys Val Ala Asp Leu Asp Pro Ser Phe  
115 120 125

His Asp Leu Thr Glu Ala Asp Phe Gln Glu Thr Phe Asn Val Gly Ser  
130 135 140

Phe Ala Ser Gly Lys Glu Thr Met Lys Leu Gly Glu Leu Leu Glu Ala  
145 150 155 160

Leu Lys Gln Thr Tyr Cys Gly Pro Ile Gly Ala Glu Tyr Met His Ile  
165 170 175

Thr Ser Thr Glu Glu Lys Arg Trp Ile Gln Gln Arg Ile Glu Ser Gly  
180 185 190

Arg Ala Thr Phe Asn Ser Glu Glu Lys Lys Arg Phe Leu Ser Glu Leu

195

200

205

Thr	Ala	Ala	Glu	Gly	Leu	Glu	Arg	Tyr	Leu	Gly	Ala	Lys	Phe	Pro	Gly
210						215					220				
Ala	Lys	Arg	Phe	Ser	Leu	Glu	Gly	Gly	Asp	Ala	Leu	Ile	Pro	Met	Leu
225					230					235					240
Lys	Glu	Met	Ile	Arg	His	Ala	Gly	Asn	Ser	Gly	Thr	Arg	Glu	Val	Val
				245					250					255	
Leu	Gly	Met	Ala	His	Arg	Gly	Arg	Leu	Asn	Val	Leu	Asn	Val	Leu	Gly
			260					265					270		
Lys	Lys	Pro	Gln	Asp	Leu	Phe	Asp	Glu	Phe	Ala	Gly	Lys	His	Lys	Glu
		275					280					285			
His	Leu	Gly	Thr	Gly	Asp	Val	Lys	Tyr	His	Met	Gly	Phe	Ser	Ser	Asp
290						295					300				
Phe	Gln	Thr	Asp	Gly	Gly	Leu	Val	His	Leu	Ala	Leu	Ala	Phe	Asn	Pro
305					310					315					320
Ser	His	Leu	Glu	Ile	Val	Ser	Pro	Val	Val	Ile	Gly	Ser	Val	Arg	Ala
				325					330					335	
Arg	Leu	Asp	Arg	Leu	Asp	Glu	Pro	Ser	Ser	Asn	Lys	Val	Leu	Pro	Ile
			340					345						350	
Thr	Ile	His	Gly	Asp	Ala	Ala	Val	Thr	Gly	Gln	Gly	Val	Val	Gln	Glu
		355					360					365			
Thr	Leu	Asn	Met	Ser	Lys	Ala	Arg	Gly	Tyr	Glu	Val	Gly	Gly	Thr	Val
	370					375					380				
Arg	Ile	Val	Ile	Asn	Asn	Gln	Val	Gly	Phe	Thr	Thr	Ser	Asn	Pro	Leu
385					390					395					400
Asp	Ala	Arg	Ser	Thr	Pro	Tyr	Cys	Thr	Asp	Ile	Gly	Lys	Met	Val	Gln
				405					410					415	
Ala	Pro	Ile	Phe	His	Val	Asn	Ala	Asp	Asp	Pro	Glu	Ala	Val	Ala	Phe
			420					425					430		
Val	Thr	Arg	Leu	Ala	Leu	Asp	Phe	Arg	Asn	Thr	Phe	Lys	Arg	Asp	Val
		435					440					445			
Phe	Ile	Asp	Leu	Val	Ser	Tyr	Arg	Arg	His	Gly	His	Asn	Asn	Glu	Ala
450						455					460				

Asp Glu Pro Ser Ala Thr Gln Pro Leu Met Tyr Gln Lys Ile Lys Lys  
 465 470 475 480  
 His Pro Thr Pro Arg Lys Ile Tyr Ala Asp Lys Leu Glu Gln Glu Lys  
 485 490 495  
 Val Ala Thr Leu Glu Asp Ala Thr Glu Met Val Asn Leu Tyr Arg Asp  
 500 505 510  
 Ala Leu Asp Ala Gly Asp Cys Val Val Ala Glu Trp Arg Pro Met Asn  
 515 520 525  
 Met His Ser Phe Thr Trp Ser Pro Tyr Leu Asn His Glu Trp Asp Glu  
 530 535 540  
 Glu Tyr Pro Asn Lys Val Glu Met Lys Arg Leu Gln Glu Leu Ala Lys  
 545 550 555 560  
 Arg Ile Ser Thr Val Pro Glu Ala Val Glu Met Gln Ser Arg Val Ala  
 565 570 575  
 Lys Ile Tyr Gly Asp Arg Gln Ala Met Ala Ala Gly Glu Lys Leu Phe  
 580 585 590  
 Asp Trp Gly Gly Ala Glu Asn Leu Ala Tyr Ala Thr Leu Val Asp Glu  
 595 600 605  
 Gly Ile Pro Val Arg Leu Ser Gly Glu Asp Ser Gly Arg Gly Thr Phe  
 610 615 620  
 Phe His Arg His Ala Val Ile His Asn Gln Ser Asn Gly Ser Thr Tyr  
 625 630 635 640  
 Thr Pro Leu Gln His Ile His Asn Gly Gln Gly Ala Phe Arg Val Trp  
 645 650 655  
 Asp Ser Val Leu Ser Glu Glu Ala Val Leu Ala Phe Glu Tyr Gly Tyr  
 660 665 670  
 Ala Thr Ala Glu Pro Arg Thr Leu Thr Ile Trp Glu Ala Gln Phe Gly  
 675 680 685  
 Asp Phe Ala Asn Gly Ala Gln Val Val Ile Asp Gln Phe Ile Ser Ser  
 690 695 700  
 Gly Glu Gln Lys Trp Gly Arg Met Cys Gly Leu Val Met Leu Leu Pro  
 705 710 715 720  
 His Gly Tyr Glu Gly Gln Gly Pro Glu His Ser Ser Ala Arg Leu Glu

725

730

735

Arg Tyr Leu Gln Leu Cys Ala Glu Gln Asn Asn Gln Val Cys Val Pro  
740 745 750

Ser Thr Pro Ala Gln Val Tyr His Met Leu Arg Arg Gln Ala Leu Arg  
755 760 765

Gly Met Arg Arg Pro Leu Val Val Met Ser Pro Lys Ser Leu Leu Arg  
770 775 780

His Pro Leu Ala Val Ser Ser Leu Glu Glu Leu Ala Asn Gly Thr Phe  
785 790 795 800

Leu Pro Ala Ile Gly Glu Glu Ile Asp Glu Leu Asp Pro Lys Gly Val  
805 810 815

Lys Arg Val Val Met Cys Ser Ser Gly Lys Val Tyr Tyr Asp Leu Leu  
820 825 830

Glu Gln Arg Arg Lys Asn Asn Gln His Asp Val Ala Ile Val Arg Ile  
835 840 845

Glu Gln Leu Tyr Pro Phe Pro His Lys Ala Met Gln Glu Val Leu Gln  
850 855 860

Gln Phe Ala His Val Lys Asp Phe Val Trp Cys Gln Glu Glu Pro Leu  
865 870 875 880

Asn Gln Gly Ala Trp Tyr Cys Ser Gln His His Phe Arg Glu Val Ile  
885 890 895

Pro Phe Gly Ala Ser Leu Arg Tyr Ala Gly Arg Pro Ala Ser Ala Ser  
900 905 910

Pro Ala Val Gly Tyr Met Ser Val His Gln Lys Gln Gln Gln Asp Leu  
915 920 925

Val Asn Asp Ala Leu Asn Val Glu  
930 935

<210> 9

<211> 405

<212> PRT

<213> Escherichia coli

<400> 9

Met	Ser	Ser	Val	Asp	Ile	Leu	Val	Pro	Asp	Leu	Pro	Glu	Ser	Val	Ala
1				5					10					15	
Asp	Ala	Thr	Val	Ala	Thr	Trp	His	Lys	Lys	Pro	Gly	Asp	Ala	Val	Val
			20					25					30		
Arg	Asp	Glu	Val	Leu	Val	Glu	Ile	Glu	Thr	Asp	Lys	Val	Val	Leu	Glu
		35					40					45			
Val	Pro	Ala	Ser	Ala	Asp	Gly	Ile	Leu	Asp	Ala	Val	Leu	Glu	Asp	Glu
	50					55					60				
Gly	Thr	Thr	Val	Thr	Ser	Arg	Gln	Ile	Leu	Gly	Arg	Leu	Arg	Glu	Gly
65					70					75				80	
Asn	Ser	Ala	Gly	Lys	Glu	Thr	Ser	Ala	Lys	Ser	Glu	Glu	Lys	Ala	Ser
				85					90					95	
Thr	Pro	Ala	Gln	Arg	Gln	Gln	Ala	Ser	Leu	Glu	Glu	Gln	Asn	Asn	Asp
			100					105					110		
Ala	Leu	Ser	Pro	Ala	Ile	Arg	Arg	Leu	Leu	Ala	Glu	His	Asn	Leu	Asp
		115					120					125			
Ala	Ser	Ala	Ile	Lys	Gly	Thr	Gly	Val	Gly	Gly	Arg	Leu	Thr	Arg	Glu
	130					135					140				
Asp	Val	Glu	Lys	His	Leu	Ala	Lys	Ala	Pro	Ala	Lys	Glu	Ser	Ala	Pro
145					150				155						160
Ala	Ala	Ala	Ala	Pro	Ala	Ala	Gln	Pro	Ala	Leu	Ala	Ala	Arg	Ser	Glu
				165					170					175	
Lys	Arg	Val	Pro	Met	Thr	Arg	Leu	Arg	Lys	Arg	Val	Ala	Glu	Arg	Leu
			180					185					190		
Leu	Glu	Ala	Lys	Asn	Ser	Thr	Ala	Met	Leu	Thr	Thr	Phe	Asn	Glu	Val
		195					200					205			
Asn	Met	Lys	Pro	Ile	Met	Asp	Leu	Arg	Lys	Gln	Tyr	Gly	Glu	Ala	Phe
	210					215					220				
Glu	Lys	Arg	His	Gly	Ile	Arg	Leu	Gly	Phe	Met	Ser	Phe	Tyr	Val	Lys
225					230				235						240
Ala	Val	Val	Glu	Ala	Leu	Lys	Arg	Tyr	Pro	Glu	Val	Asn	Ala	Ser	Ile



245

250

255

Asp Gly Asp Asp Val Val Tyr His Asn Tyr Phe Asp Val Ser Met Ala  
 260 265 270

Val Ser Thr Pro Arg Gly Leu Val Thr Pro Val Leu Arg Asp Val Asp  
 275 280 285

Thr Leu Gly Met Ala Asp Ile Glu Lys Lys Ile Lys Glu Leu Ala Val  
 290 295 300

Lys Gly Arg Asp Gly Lys Leu Thr Val Glu Asp Leu Thr Gly Gly Asn  
 305 310 315 320

Phe Thr Ile Thr Asn Gly Gly Val Phe Gly Ser Leu Met Ser Thr Pro  
 325 330 335

Ile Ile Asn Pro Pro Gln Ser Ala Ile Leu Gly Met His Ala Ile Lys  
 340 345 350

Asp Arg Pro Met Ala Val Asn Gly Gln Val Glu Ile Leu Pro Met Met  
 355 360 365

Tyr Leu Ala Leu Ser Tyr Asp His Arg Leu Ile Asp Gly Arg Glu Ser  
 370 375 380

Val Gly Phe Leu Val Thr Ile Lys Glu Leu Leu Glu Asp Pro Thr Arg  
 385 390 395 400

Leu Leu Leu Asp Val  
 405

<210> 10

<211> 41

<212> PRT

<213> Enterobacter agglomerans

<400> 10

Met Asn Leu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr Gly  
 1 5 10 15

Met Pro Ala Pro Thr Gly Tyr Ala Cys Thr Thr Pro Arg Glu Ala Glu  
 20 25 30

Glu Ala Ala Ser Lys Ile Gly Ala Gly  
35 40

<210> 11

<211> 61

<212> PRT

<213> Escherichia coli

*Bl*  
*But*  
<400> 11

Met Asn Leu Glu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr  
1 5 10 15

Gly Leu Pro Ala Pro Val Gly Tyr Ala Cys Tyr Tyr Pro Arg Glu Ala  
20 25 30

Glu Glu Ala Ala Ser Lys Ile Gly Ala Gly Pro Trp Val Val Lys Cys  
35 40 45

Gln Cys His Ala Gly Gly Arg Gly Lys Ala Gly Gly Val  
50 55 60

<210> 12

<211> 58

<212> PRT

<213> Escherichia coli

<400> 12

Phe Leu Ile Asp Ser Arg Asp Thr Glu Thr Asp Ser Arg Leu Asp Gly  
1 5 10 15

Leu Ser Asp Ala Phe Ser Val Phe Arg Cys His Ser Ile Met Asn Cys  
20 25 30

Val Ser Cys Ser Pro Lys Gly Leu Asn Pro Thr Arg Ala Ile Gly His  
35 40 45

Ile Lys Ser Met Leu Leu Gln Arg Asn Ala  
50 55